

# HEALTHY BUILDINGS— IAQ '91

**Planning, Designing, Constructing,  
Renovating & Occupying Buildings:  
Recommendations & Benefits**

Organized by:

**American Society of Heating, Refrigerating and Air-Conditioning Engineers**

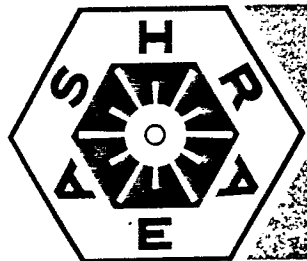
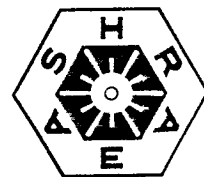
and

**The International Council for Building Research, Studies and Documentation**



# IAQ91

Manufacturers' Product  
and Service Session  
Saturday, September 7, 1991



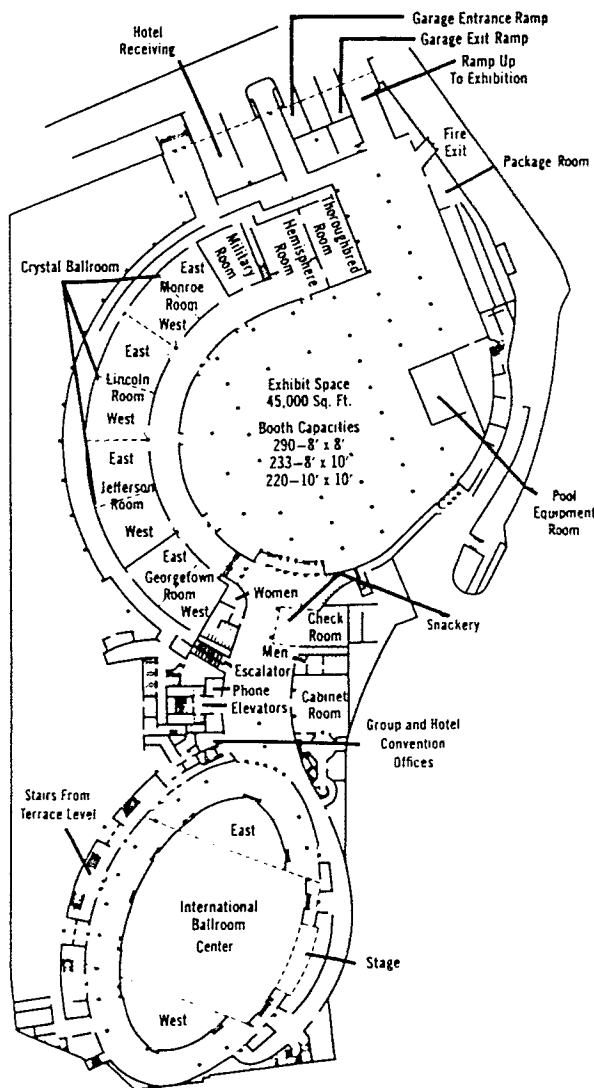
**September 4-8, 1991  
Washington, DC, USA**

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# REGISTRATION/INFORMATION DESK (Continued)

All technical sessions will be held in the Washington Hilton and Towers. Technical sessions are scheduled in the Jefferson and Monroe Rooms located on the Concourse Level.

## Map of Concourse Level



## Publications

Past IAQ Symposia Proceedings and ASHRAE Standards related to indoor air quality will be available for purchase in the registration area.

## Recording of Sessions

ASHRAE regards the materials presented at its meetings and conferences to be unique products of the Society, and it exercises control over the dissemination and/or use of such products. Accordingly, videotaping and recording of program sessions is not allowed without ASHRAE's prior written consent.

## Social Functions

### Receptions

#### Wednesday, September 4

5:30 pm—7:30 pm  
Lincoln Room (Concourse Level)  
Cash bar.  
Opening Ceremonies

#### Saturday, September 7

5:00 pm—6:00 pm  
Exhibit Hall (Concourse Level)  
Full registrants receive two complimentary drink tickets

### Luncheons

#### Thursday, September 5

12:00 N—1:00 pm  
Lincoln & Monroe West

#### Friday, September 6

12:00 N—1:00 pm  
Lincoln & Monroe West

#### Saturday, September 7

12:00 N—1:00 pm  
Lincoln & Monroe West  
Lincoln & Monroe West located on Concourse level  
Additional tickets for luncheons are available at the Registration Desk for \$25.

### Dinner Cruise

#### Thursday, September 5

6:00 pm Buses will begin boarding from the Hilton, T Street Entrance (Terrace Level)  
6:15 pm Buses will depart for Pier  
7:00 pm Cruise departs from Pier 4, 6th and Water St  
Dinner Cruise offers a buffet which includes three salads, three entrees, side dishes and desserts Entertainment includes 2 live bands and a Broadway revue performed by talented waiters and waitresses Climate controlled on three fully enclosed decks.  
10:00 pm Cruise returns to pier. Buses boarded for return to Hilton

Additional tickets for the Dinner Cruise are available at the Registration Desk for \$50.

## Messages

To contact an individual attending the conference Wednesday, September 4 through Sunday, September 8, between 8:00 am and 4:00 pm, call the Washington Hilton and Towers at (202) 483-3000 and ask for the ASHRAE Registration Desk. At all other times, it will be necessary to call the hotel and leave a message in the individual's room.



# PROGRAM SCHEDULE

## Wednesday, September 4

5:30—7:30pm  
6:00

Welcome Reception (Lincoln Ballroom)  
Opening Ceremonies (Lincoln Ballroom)  
Larry Berglund, Healthy Buildings—IAQ'91 Chairman; Don Rich, ASHRAE President;  
Ron Biggs, representing George Seaden, CIB President

## Thursday, September 5

8:00

**Architecture of Healthy Buildings**  
Keynote Address: Environmental Quality in Architecture  
W. McDonough (Jefferson Ballroom)

8:45

Overview Lecture: Architecture of Healthy Buildings  
H. Levin (Jefferson Ballroom)

9:15

Symposium: Indoor/Outdoor Relationships from the Architectural Perspective  
H. Levin, chairman (Jefferson Ballroom)  
1. IAQ and Thermal Comfort in the Design of Healthy Buildings  
L. Berglund  
2. Materials in the Design of Healthy Buildings  
P. Bierman-Lytle  
3. Designing Healthy Energy-Efficient Buildings  
H. Gordon

10:15—10:30am

Break

10:30—12:00m

Workshops

1. IAQ and Thermal Comfort in the Design of Healthy Buildings  
J. Woods, facilitator (Jefferson East)
  2. Materials in the Design of Healthy Buildings  
J. Girman, facilitator (Jefferson West)
  3. Designing Healthy Energy-Efficient Buildings  
K. Teichman, facilitator (Monroe East)
- Luncheon (Lincoln and Monroe West)

12:00—1:00pm

## Thursday, September 5

1:00

**Construction and Renovation for Healthy Buildings**  
Overview Lecture: Construction and Renovation for Healthy Buildings  
A. Wheeler (Jefferson Ballroom)

1:30

Symposium: IAQ Concerns in Building Construction and Renovation  
L. Berglund, chairman  
1. Protecting Building Occupants During Construction and Renovation  
J. Tiffany, E. Light  
2. The Importance of Commissioning in Achieving Successful Healthy Buildings  
H. Brickman

2:15—2:35pm

Break

2:35—4:00pm

Concurrent Workshops (3): Measures to Achieve Good IAQ in Occupied Buildings During Construction & Renovation

1. H. Besch, facilitator (Jefferson East)
2. ~~H. Levin~~, facilitator, (Monroe East)  
*P. Morey*

4:00—5:45pm

**Technical Paper Sessions**

### SESSION 1A

**Thursday 4:00—5:45pm Room: Jefferson East**  
*chairman: D. Walkinshaw, co-chairman: T. Lindvall*  
(healthy building strategies/productivity)

4:00 J. Wenger

Healthy Building Strategies

4:15 J. Farant,  
V. Nguyen,  
J. Leduc,  
M. Auger

Impact of Office Design and Layout on the Effectiveness of Ventilation Provided to Individual Workstations in Office Buildings

# PROGRAM SCHEDULE *(Continued)*

- 4:30 P. Drake,  
P. Mill,  
V. Hartkopf,  
V. Loftness,  
F. Dubin,  
G. Ziga Strategies for Health Promotion Through User-Based Environmental Control: A Select International Perspective
- 4:45 C. Nelson,  
C. Clayton  
L. Wallace,  
M. Kollander,  
R. Bascom,  
V. Highsmith,  
B. Leaderer EPA's Indoor Air Quality and Work Environment Survey: Relationships of Employees' Self-Reported Health Symptoms with Direct Air Quality Measurements
- 5:00 H. Hall,  
W. Cain,  
A. Fidler,  
B. Leaderer Influence of Building Related Symptoms on Self Reported Productivity
- 5:15 J. Zimmerman Indoor Air Quality: A Practical Guide for Minimizing Consultant Malpractice Exposure
- 5:30 M. Black,  
W. Pearson,  
J. Brown,  
S. Sadie,  
L. Schultz,  
J. Peard,  
W. Robertson,  
J. Lawhon State of Washington's Experimental Approach to Controlling IAQ in New Construction

## SESSION 1B

Thursday 4:00—5:45pm Room: Jefferson West  
chairman: J. Talbott, co-chairman: B. Pettersson  
(energy and design issues)

- 4:00 T. Robinson,  
P. Russell Healthy Indoor Environments for Energy Efficient Housing
- 4:15 M. Koontz,  
S. Lee,  
J. Spears,  
J. Kesselring Computer Program for Sizing Residential Energy Recovery Ventilator
- 4:30 L. Wallace,  
C. Nelson,  
G. Duntelman Workplace Characteristics Associated with Health and Comfort Concerns in Three Office Buildings in Washington, DC, USA
- 4:45 A. Hedge Healthy Office Lighting for Computer Workers: A Comparison of Lensed-Indirect and Direct Systems
- 5:00 J. Chang,  
Z. Guo The Effects of Building Features on Indoor Air and Pollutant Movements
- 5:15 C. Bayer,  
C. Downing Does a Total Energy Recovery System Provide a Healthier Indoor Environment?
- 5:30 M. Meckler Indoor Air Quality—From Commissioning Through Building Operations

## SESSION 1C

Thursday 4:00—5:45pm Room: Monroe East  
chairman: B. Berglund, co-chairman: D. Moschandreas  
(ventilation)

- 4:00 J. Sundell,  
T. Lindvall,  
B. Stenberg Influence of Type of Ventilation and Outdoor Air-Flow Rate on the Prevalence of SBS Symptoms

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## PROGRAM SCHEDULE (Continued)

- ✓ 4:15 R. Menzies, J. Farant, R. Tamblyn, J. Hanley, R.T. Tamblyn, F. Nunes, P. Marcotte The Effect of Varying Levels of Outdoor Ventilation on Symptoms of Sick Building Syndrome
- ✓ 4:30 C. Collett, J. Ventresca, S. Turner The Impact of Increased Ventilation on Indoor Air Quality
- ✓ 4:45 N. Nagda, M. Koontz, R. Albrecht Effect of Ventilation Rate in a Healthy Building
- 5:00 O. Strindehag, L. Norell Long-Term Experience with Demand Controlled Ventilation Systems
- 5:15 (J. Pekkinen), J. Laurikainen Calculation Method for Air Flow Rate in Displacement Ventilation Systems
- 5:30 M. Koganei, N. Buenconsejo, Jr., M. Inokuchi, T. Fujii Applicability of Displacement Ventilation to Offices in Japan
- 6:00- 10:00pm Potomac River Dinner Cruise  
Busses begin boarding at 6:00 from T Street entrance of Hilton (Terrace Level)
- Friday, September 6**
- ✓ 8:00 Keynote Address: Life-Cycle Considerations for Materials  
R. Berkebile (Jefferson Ballroom)
- ✓ 8:45 Overview Lecture: Comprehensive Evaluation of Materials  
G. Tucker (Jefferson Ballroom)
- 9:15-10:15am Symposium: Evaluating Materials for Healthy Buildings  
D. Moschandreas, chairman (Jefferson Ballroom)
1. Measuring Emission Rates and Compositions  
B. Tichenor
  2. Predicting Exposures to Emissions  
L. Sparks
  3. Measuring Respiratory Irritancy of Emissions  
R. Anderson
- 10:15-10:30am Break
- 10:30-12:00 noon Concurrent Workshops (3): Role of Source Control and Ventilation
- ✓ 1. G. Tucker, facilitator (Jefferson East)
  2. D. Moschandreas, facilitator (Jefferson West)
  3. J. Girman, facilitator (Monroe East)
- 12:00-1:00pm Luncheon (Lincoln and Monroe West)
- 1:00-3:00pm **Technical Paper Sessions**
- ✓ **SESSION 2A**
- Friday 1:00-3:00pm Room: Jefferson East**  
chairman: J. Cone, co-chairman: B. Berglund (contaminants)
- ✓ 1:00 L. Ekberg Indoor Air Quality in a New Office Building
- 1:15 P. Morey, C. Willimas Is Porous Insulation Inside an HVAC System Compatible with a Healthy Building?
- 1:30 R. Tamblyn, R. Menzies, P. Comtois, J. Hanley, R.T. Tamblyn, J. Ferant, P. Marcotte A Comparison of Two Methods of Evaluating the Relationship Between Fungal Spores and Respiratory Symptoms Among Office Workers in Mechanically Ventilated Buildings

# PROGRAM SCHEDULE (Continued)

Sick Building Syndrome

- 1:45 A. Pasanen, Airborne Bacteria and Fungi in Rural Houses in Finland  
M. Tuomainen,  
P. Kallikowski,  
A. Nevalainen
- 2:00 F. Lewis, Protocol for Microbiological Control in Office Buildings after Water Intrusion (Flooding)  
C. Yang,  
F. Zampello
- 2:15 A. Nevalainen, Indoor Air Bacteria in Apartment Homes Before and After Occupancy  
H. Heinonen-Tanski,  
T. Raunmaa,  
T. Reponen
- 2:30 A. Hedge, The Effects of Smoking Policy on Indoor Air Quality and Sick Building Syndrome in 18 Air-  
W. Erickson, Conditioned Offices  
G. Rubin
- 2:45 P. Wolkoff, Field and Laboratory Emission Cell: FLEC  
P. Clausen,  
P. Nielsen,  
H. Gustafsson  
B. Jonsson,  
E. Rasmussen

stems

Level)

## SESSION 2B

Friday 1:00—3:00pm Room: Jefferson West  
chairman: J. Hill, co-chairman: E. Mayer  
(thermal, air flow & humidity issues)

- 1:00 T. Inoue, Thermal Environment with Underfloor Air-Conditioning System  
K. Yokoyama
- 1:15 T. Yamamoto, Two Dimensional Turbulence Flow Model for a Personal Computer  
L. Sparks,  
D. Ensor
- 1:30 R. Farrington, Use of Infrared Imaging to Determine the Mixing Performance of Supply Air Diffusers  
V. Hassani
- 1:45 Ma Ren Min, Experimental Study on the Performance and Thermal Comfort of Spot Cooling System  
Qin Hong
- 2:00 R. Heinsohn Predicting Transient Concentrations at Arbitrary Points in an Undivided Space
- 2:15 Dong Qiang, Climate and Atmospheric Cleanliness of Underground Public Construction in Chongqing  
H. Xiu,  
X. Quanqing  
B. Shufen
- 2:30 G. Tsongas Field Study of Indoor Moisture Problems and Damage in New Northwest Homes
- 2:45 P. Martin Criteria for Selection of Soft Furnishings for Healthy Buildings

## SESSION 2C

Friday 1:00—3:00pm Room: Monroe East  
chairman: E. Besch, co-chairman: S. Rose  
(School related issues)

- 1:00 A. Wheeler, Meeting the Objectives of Energy Conservation and Ventilation for Acceptable Indoor Air  
A. Abend Quality in the Classroom
- 1:15 J. Pejtersen, Air Pollution Sources in Kindergartens  
G. Clausen,  
J. Sorensen,  
D. Quistgaard,  
G. Iwashita,  
Y. Zhang,  
T. Onishi,  
P. Fanger

Healthy Building?

Open Fungal Spores and  
Related Buildings

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## PROGRAM SCHEDULE *(Continued)*

- 1:30 R. Thompson, Diagnostic and Remediation for Healthy Schools  
F. McKnight,  
G. Fisher,  
W. Turner,  
T. Brennan
- 1:45 T. Brennan, School Buildings with Air Exchange Rates that do not Meet Minimum Professional  
M. Clarkin, Guidelines or Codes—Implications for Radon Control  
W. Turner,  
G. Fisher,  
R. Thompson
- 2:00 A. Craig, Cost and Effectiveness of Radon-Resistant Features in New School Buildings  
K. Leovic,  
D. Saum
- 2:15 B. Rock, Modelling of Ventilation System Performance Using Laplace Transform Techniques: Part 1:  
R. Anderson, Method  
M. Brandemuehl
- 2:30 B. Rock, Modelling of Ventilation System Performance Using Laplace Transform Techniques: Part 2:  
R. Anderson, Applications  
M. Brandemuehl
- 2:45 M. Levitsky, Control of Exposure to Diesel Exhaust Emissions in Fire Stations  
J. Noonan  
O. Malik,  
S. Kwok,  
H. Vogt
- 3:00- 3:15pm Break
- 3:15- 5:15pm Technical Paper Sessions
- SESSION 3A** Friday 3:15—5:45pm Room: Jefferson East  
*chairman: S. Rose, co-chairman: H. Levin*  
(sources and sinks)
- 3:15 H. Gustafsson Building Materials Identified as Major Emission Sources
- 3:30 K. Saarela, Comparative Emission Studies of Flooring Materials with Reference to Nordic Guidelines  
E. Sandell
- 3:45 M. Black, A Methodology for Determining VOC Emissions from New SBR Latex Backed Carpet,  
W. Pearson, Adhesives, Cushions, and Installed System and Predicting their Impact on Indoor Air Quality  
L. Work
- 4:00 C. Bornehag Problems Associated with the Replacement of Casine-Based Self-Leveling Compound
- 4:15 B. Tichenor, Emission Rates of Mercury from Latex Paints  
Z. Guo,  
J. Dorsey
- 4:30 M. Stockton Catalog of Materials as Potential Source of Indoor Air Pollution  
P. Spaite,  
J. McLean,  
J. White,  
M. Jackson
- 4:45 U. Kjaer, Adsorption and Desorption of Organic Compounds on Fleecy Materials  
P. Nielsen
- 5:00 L. Sparks Analysis of IAQ Control Options and the Effects of Sources and Sinks
- 5:15 J. Strobridge Volatile Organic Compounds and Particle Emission Rates and Predicted Air Concentrations  
M. Black Related to Movable Partitions and Office Furniture
- 5:30 J. Davidson, Carpet Installation During Building Renovation and Its Impact on Indoor VOC Concentrations  
M. Black,  
N. Pearson,  
L. Work  
D. Miller